Space Weather Technical Forecast

Issued on Monday, 08 April 2024 at 13:24 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant activity expected.

Analysis of Space Weather Activity over past 24 hours.
Solar Activity: Low activity with four C-class flares observed, reaching a peak of C1.4 at 08/0314UTC from AR3634 in the northeast quadrant. There are six sunspot regions on the visible disc with AR3630 fading during the last 24 hours. AR3628 is the largest region, but is evolving only slowly and is relatively stable. The remaining regions are all small and benign. There have been no Earth-directed CME observed on available imagery, but a filament eruption to the northeast, and resulting CME will be analysed once sufficient imagery becomes available.

Solar Wind / Geomagnetic Activity: The solar wind has shown evidence of two events in the last 24 hours. A transient CME appears to have arrived at Earth at around 08/0123UTC and then a high speed stream connection from coronal hole 20 at around 08/0906UTC. Solar wind speeds initially declined from around 425km/s to 375km/s but then increased to around 400km/s due to the arrival of the CME. A further decline followed with a slight increase from 360km/s to a peak of 380km/s due to the high speed stream connection. Density was around average, but increased to f 8ppcc at 08/0137UTC due to the transient CME and then followed a rising trend before another peak at 08/0851UTC due to a CIR ahead of the high speed stream onset. Total magnetic field strength increased from 4nT to 8nT due to the CME arrival and then after a decline reached 7nT following the weak high speed stream connection. The north-south component, Bz was mainly weakly negative, but switched to mainly weakly positive from 08/0859UTC. Phi angle was predominantly negative (towards the Sun), but became positive from 08/0909UTC. Geomagnetic activity was Quiet (Kp 1-2).

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) observed at GOES-18 was at background. High energy electron flux (greater than 2MeV) observed at GOES-16 was background to moderate, peaking 424 pfu at 06/1515 UTC. The associated 24-hour fluence remained well below the Active (1e8 integrated flux) threshold, with a value of 1.11e7 integrated pfu at 08/0000UTC.

Four-Day Space Weather Forecast Summary
Solar Activity: Low activity is likely, with a slight chance of Moderate, especially later in the period.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs. Solar wind speeds are representative of a weak coronal hole high speed stream connection from coronal hole 20. Speeds of 400-450km/s possible through 08 and 09 Apr, prior to a decline towards background levels through 10 and 11 Apr. Geomagnetic activity is forecast to be mainly Quiet with Unsettled intervals, but increasing to Unsettled with Active intervals due to the fast wind enhancement.

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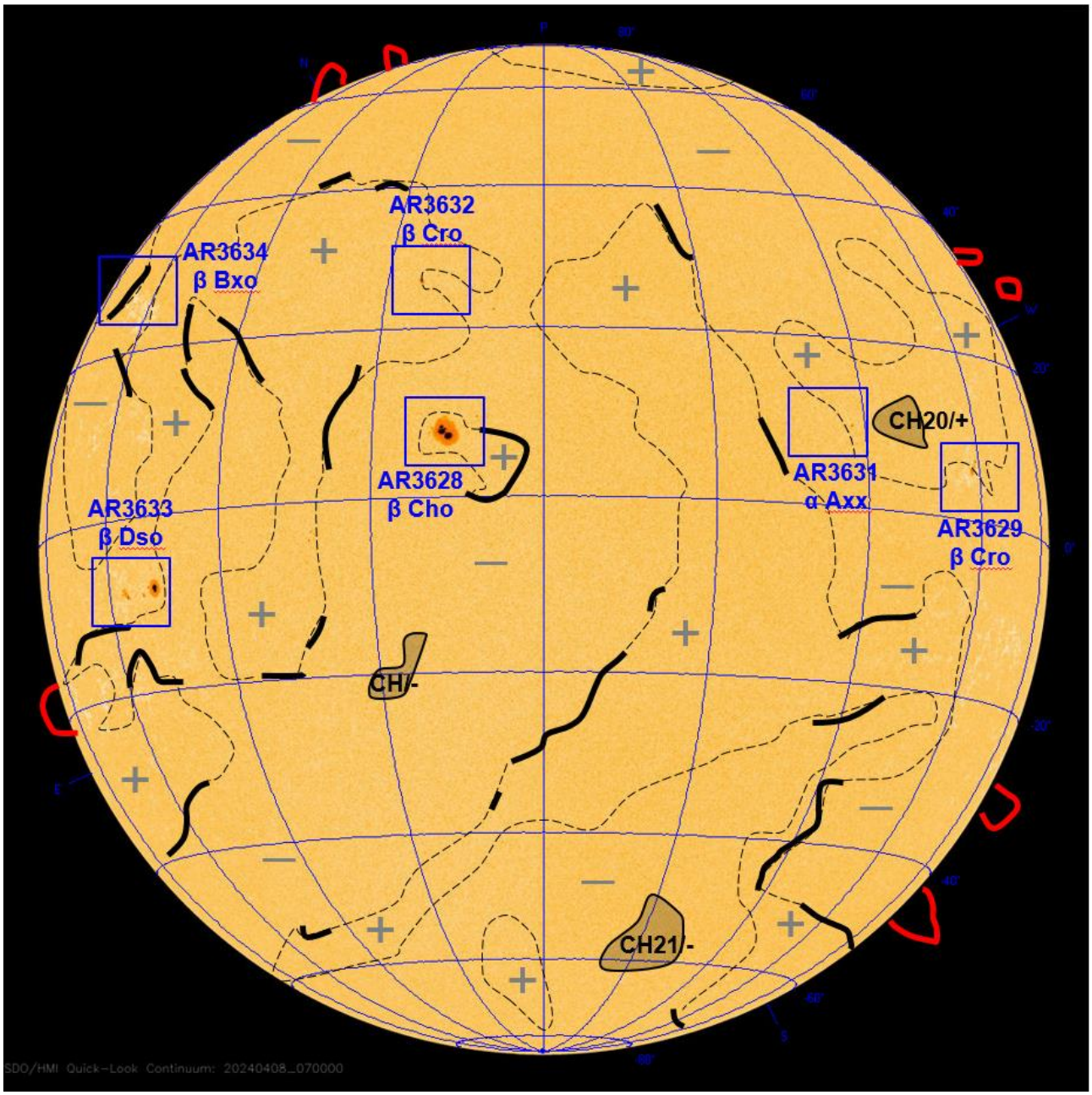
Energetic Particles / Solar Radiation: High energy proton flux as observed by GOES-18, is expected to persist at background. High energy electron flux at GOES-16 is expected to continue at background on 08 Apr due to the high speed stream, but then perhaps increase to oscillate between background and moderate from 09 Apr due to weak high speed stream. The associated 24 electron fluence is expected to remain below Active.

Figure 1. Solar Analysis Valid 08/0800UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:
There are no Earth-directed CMEs.

Solar wind speeds have been close to slightly elevated levels, but on a declining trend from around 410km/s to between 350-400km/s. Initially the solar wind environment appears to have been affected by a transient CME. As this subsided the Earth appears to have now connected to a high speed stream from coronal hole 20. Although there was a notable CIR (co-rotating interaction region) ahead of the onset of the high speed stream speeds appear to be muted, at around 400km/s. A further increase is still possible, but speeds are forecast to peak at around 400-450km/s through 08 and 09 Apr, but then soon decline on 10 and 11 Apr, as the solar wind declines to background levels due to the size of the coronal hole. A further feature is suggested in centre disc, giving a further increase from 11 Apr, but this is low confidence given the lack of observational data.

Mainly Quiet geomagnetic activity is expected, with a slight chance of Unsettled intervals. A spell of Unsettled with Active intervals is possible due to the onset of the high speed stream from coronal hole 20.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	5	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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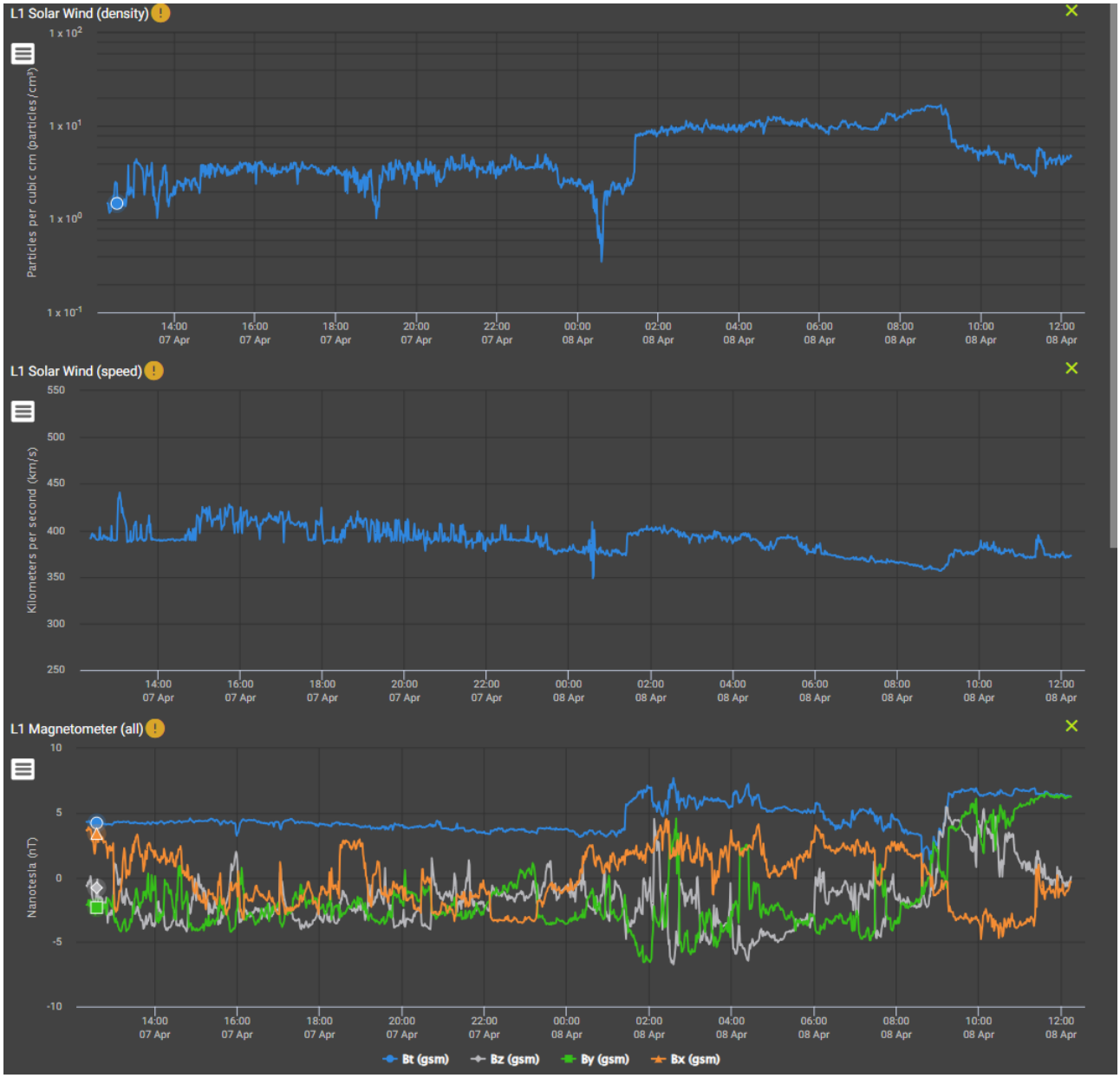
Figure 2: L1 DSCOVR solar wind parameters



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Radio Blackouts - X-Ray Flares:

Activity is expected to be Low with isolated C-class flares and a slight chance of M-class flaring.

There are only six sunspot regions on the visible disc, with AR3628 being the most dominant region, but is still relatively simple. A number of smaller regions have also developed, but currently present a limited risk of significant flaring. The risk is forecast to gradually increase later in the period as activity from the farside rotates onto the visible side of the Sun.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	15	20	30	30
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

High energy proton flux as observed by GOES-18 is at background and expected to persist at this level with the currently visible active regions not expected to bring a risk of proton rich flares.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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High Energy Electrons Event (≥ 2MeV):
High energy electron flux is likely to be mainly at background at first due to any geomagnetic activity induced from the connection with coronal hole 20, but may then oscillate between background and moderate levels due to the albeit weak high speed stream. High levels are considered unlikely given the anticipated relatively modest strength of this connection.
Electron fluence is forecast to follow a rising trend due to the onset of the high speed stream but is not expected to exceed the Active threshold.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^{8}$	No	1	1	1	1
Very Active	≥ 2 MeV ≥ $1x10^{9}$	No	1	1	1	1

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